Water 84-85

Santa Clara Valley Water District

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SANTA CLARA VALLEY WATER DISTRICT

WATER CONDITIONS
1984-85

Prepared
by

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I. SUMMARY OF 1984-85 WATER CONDITIONS

During the period October 1, 1984 through September 30, 1985, precipitation was below average in the Santa Clara Valley and Llagas Subbasins. As a consequence, the volume of groundwater in storage in these two subbasins decreased over the previous year. The Santa Clara Valley Subbasin at the end of 1984-85 showed a decrease in the volume of groundwater in storage of 58,000 acre-feet. In the Coyote Groundwater Subbasin, the volume of water in storage increased by 2,000 acre-feet and the Llagas Groundwater Subbasin showed a decrease of 15,000 acre-feet.

The volume of water stored in the County's conservation reservoirs decreased during the same period by 44,000 acre-feet. No reservoirs were full at anytime during 1984-85. Of the 44,000 acre-feet, the Gavilan Water District reservoirs accounted for a decrease of 2,000 acre-feet.

During 1984-85, the District imported 100,000 acre-feet of water through the South Bay Aqueduct. The Rinconada Water Treatment Plant treated 53,000 acre-feet of this water and the Penitencia Water Treatment Plant treated 26,000 acre-feet. Groundwater recharge or direct use accounted for the remaining 21,000 acre-feet. Hetch Hetchy deliveries to Santa Clara County amounted to 66,000 acre-feet during 1984-85.

Subsidence has been effectively halted since 1969. This is the result of groundwater levels having risen and remained above the critical pressure elevation.

As of September 30, 1985, about 100 incidents of groundwater contamination from hazardous materials were identified. Of these, two cases are of particular concern because of their potential to readily contaminate the deeper, confined portion of the groundwater basin which supplies the major municipal water supply wells. Incidents of groundwater contamination from hazardous materials in the confined zone are also of

concern to the District because of potential conduits to the deeper aquifers. Additionally, there are a number of incidents of contamination from leaking fuel tanks.

Groundwater is monitored frequently and State Assembly Bill 1803 is also requiring that all municipal treated water retailers test representative wells in the respective water systems.

II. INTRODUCTION

A major objective of the District's water resources management program is to coordinate and optimize the use of the District's total water supplies, including local surface water, groundwater, imported water, and reclaimed wastewater, and to protect the water quality. One aspect of the program is monitoring and evaluating water use and water supplies, including analyzing and updating projected water needs, and planning and implementing projects to meet the needs of the County. The monitoring of the water use and water supplies is the subject of this annual report which covers the period from October 1, 1984 to September 30, 1985. Its purpose is to inform the District Board of Directors and interested citizens of the condition of the District's water resources. The report deals with all the components of the hydrologic cycle.

The three major groundwater subbasins within the District are the Santa Clara Valley, Coyote, and Llagas Subbasins as shown on Plate 1. They are interconnected and occupy about 375 square miles or nearly 30 percent of the total County area. Groundwater constitutes about half of the total water used in the Santa Clara Valley Subbasin and almost all of that used in the Coyote and Llagas Subbasins. The remainder is supplied from local surface diversions and imported sources.

Zones of benefit have been established for the conservation, importation, treatment and distribution of water used in Santa Clara County and are also shown on Plate 1.

Zone W-2 encompasses the Santa Clara Valley Groundwater Subbasin and was formed for the registration of those groundwater producing facilities that benefit from recharge of the groundwater basin by the District with local and imported water. In this zone, a charge is levied for groundwater extracted and the revenue thus derived is used to support the District's conservation and importation program.

Two major sources of water supply income are the groundwater charge levied in Zone W-2 and the sale of treated water. The groundwater charge for nonagricultural

uses during 1984-85 was $85 an acre-foot. The groundwater charge for agricultural uses was $21.25 an acre-foot. Treated water was sold at $160 an acre-foot, with water in excess of contracted amounts sold at $110 an acre-foot.

In 1984-85, the District received about one-fourth of its revenue from ad valorem property taxes of which about 35% constituted the District's portion of the one percent Countywide tax revenue as allocated by the County Assessor in accordance with State Senate Bill 154. In addition to the allocation, the District levied taxes in Zone W-1 to pay debt service on general obligation bonds authorized in 1963 and levied a State Water Project Tax throughout the County to pay for a portion of the costs of importing water from the State through the South Bay Aqueduct.

III. HYDROLOGIC BALANCE

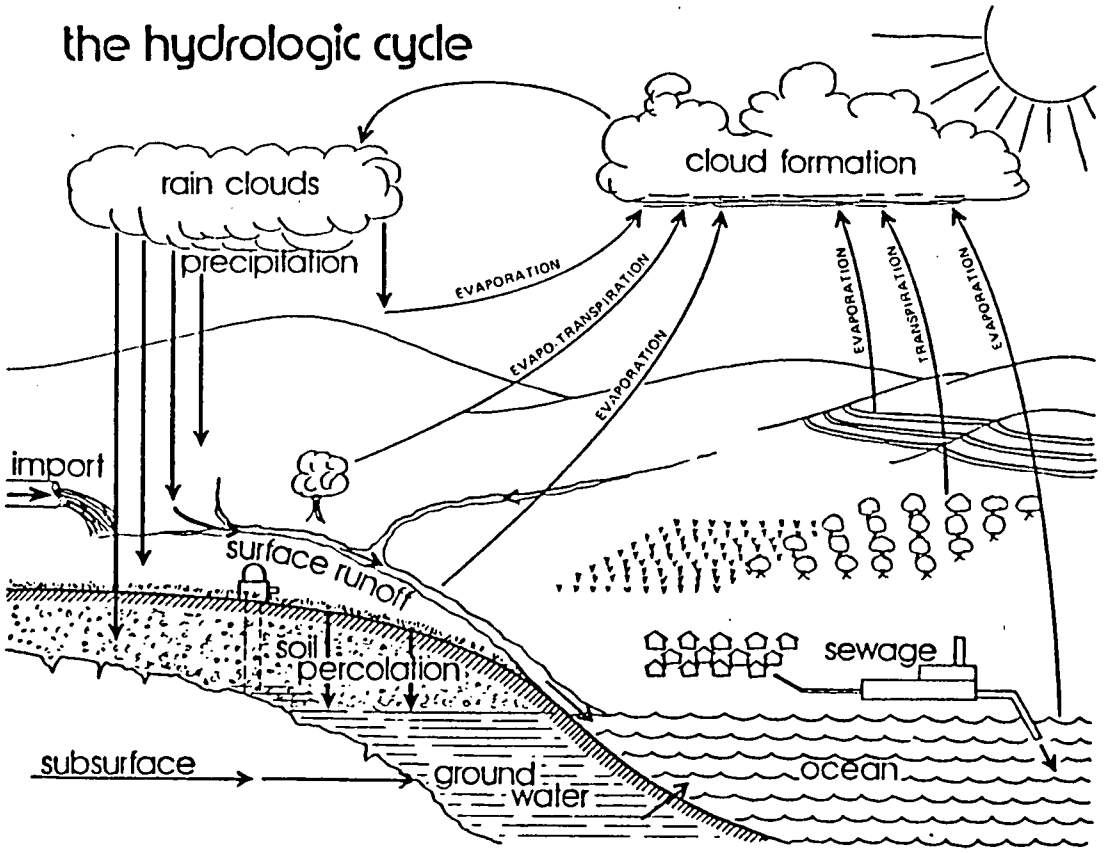
Seasonal rainfall in Santa Clara Valley was below average in 1984-85. The San Jose Municipal Weather Station No. 86, which averages 14.2 inches per year, based on 111 years of record, recorded 13.1 inches which is 92 percent of normal. At Station No. 75 in Gilroy, which averages 19.3 inches, 16.1 inches were recorded which is 83 percent of normal.

As of September 30, 1985, the amount of water in storage in all the reservoirs was 36,000 acre-feet or 55 percent less than the 80,000 acre-feet in storage on the same date of the preceding year.

With 1984-85 rainfall below average, the total volume of groundwater in storage in the Santa Clara Valley, Coyote and Llagas Groundwater Subbasins decreased. Water in storage in the Santa Clara Valley Subbasin decreased by 58,000 acre-feet. In the Coyote Subbasin the volume of water in storage increased by 2,000 acre-feet and in the Llagas Subbasin the volume of water in storage decreased by 15,000 acre-feet.

These changes of stored water were determined by multiplying estimates of the storage capacity of the aquifer materials by the area and by the change in depth in groundwater levels between the beginning and end of the season. A map showing lines of equal change in groundwater levels is shown in Plate 3.

These estimates were checked by balancing the hydrologic components of water supply and utilization. Water supply consists of precipitation, stream inflow, imported water, and subsurface inflow. Water is utilized or lost by consumptive use, sewage export, stream outflow, and subsurface outflow. The difference between supply and utilization is the net change in storage in the groundwater basins at the end of the season. The hydrologic cycle illustrated in Figure 1-B, shows a decrease in the Santa Clara Valley Subbasin of 58,000 acre-feet. The Coyote Subbasin shows an increase of 9,000 acre-feet and the Llagas Subbasin shows a decrease of 8,000 acre-feet (Figure 1-C). These compare to the previously obtained decreases of 58,000 and 15,000



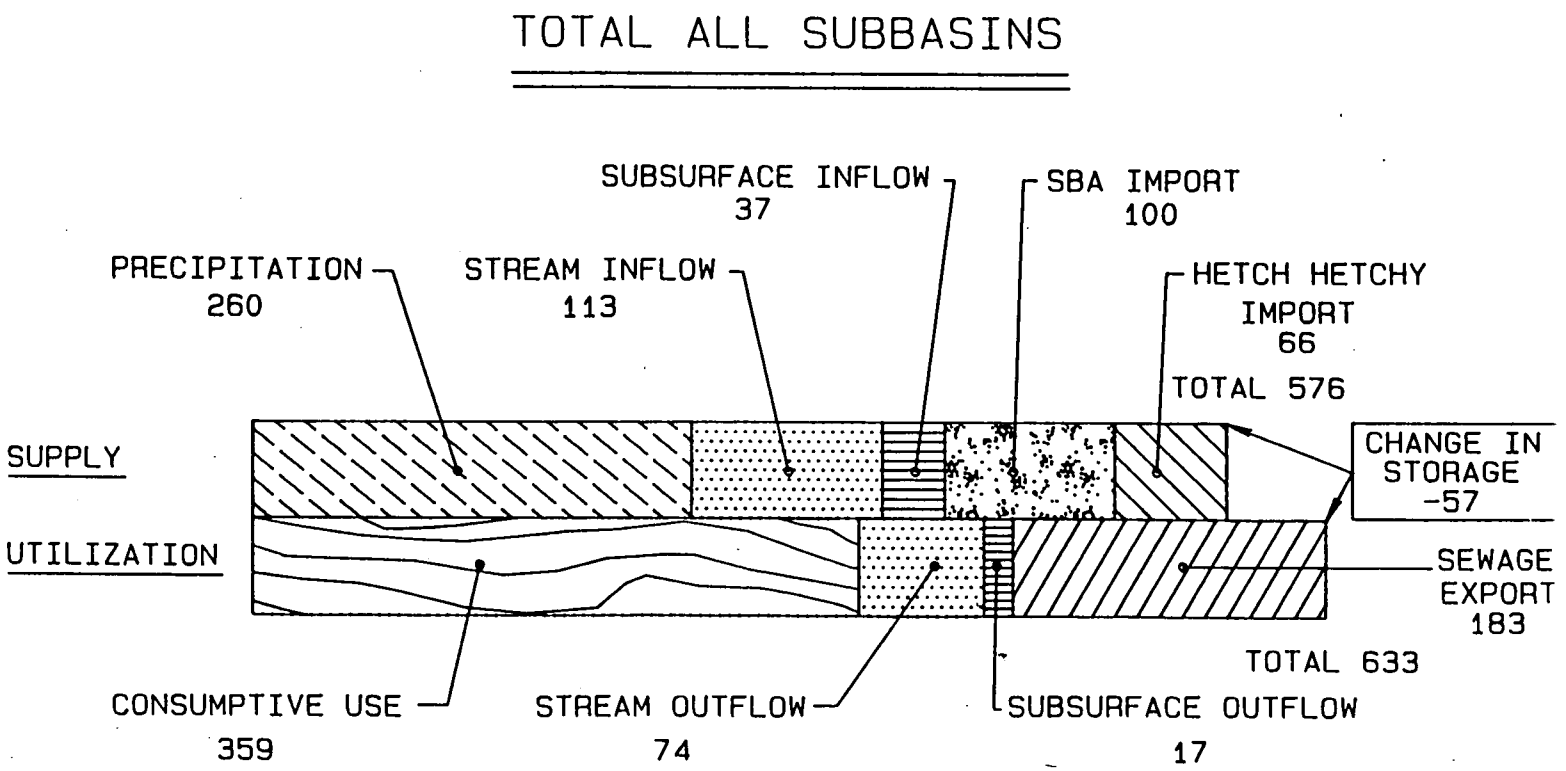


FIGURE 1-A HYDROLOGIC BALANCE OF GROUNDWATER 1984-85

Values in thousand acre-feet

SANTA CLARA VALLEY G.W. SUBBASIN

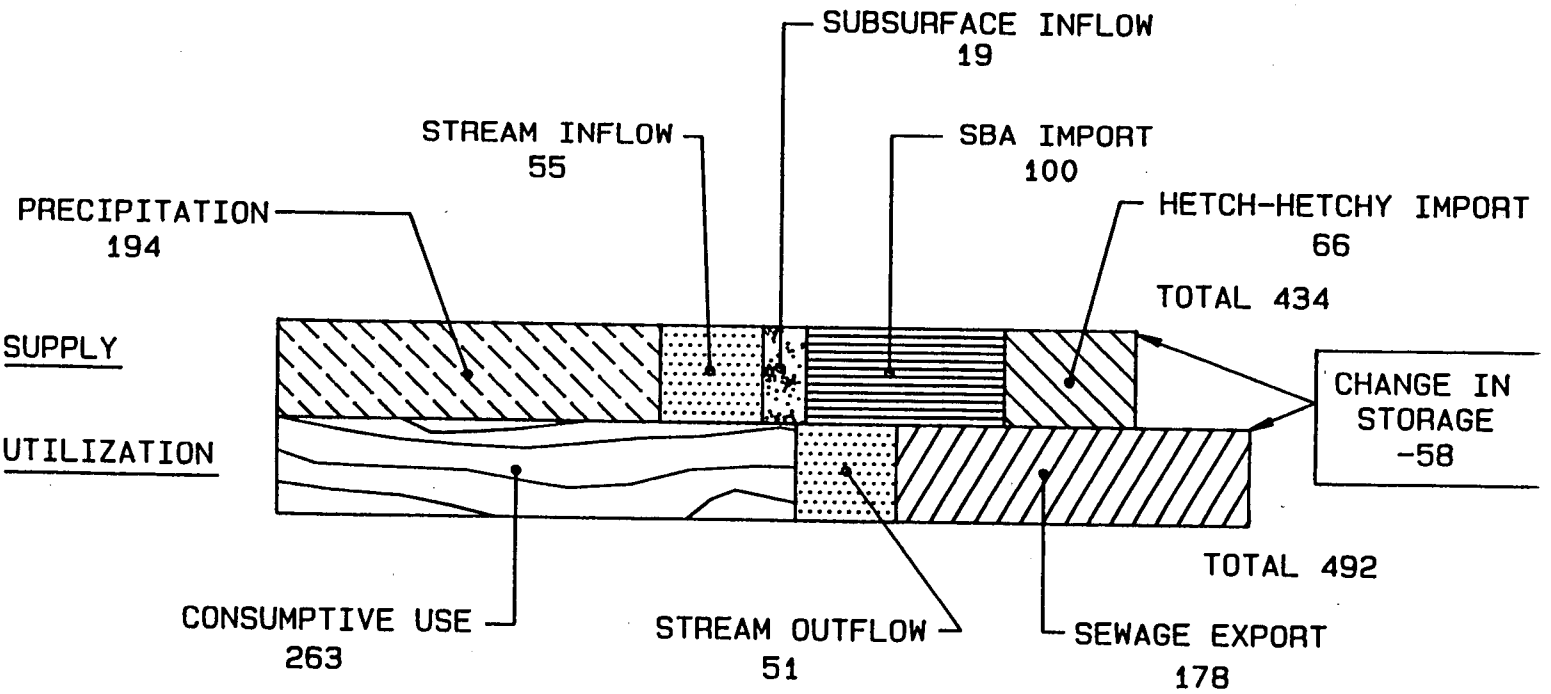


Figure 1-B Hydrologic Balance of Groundwater 1984-85

Santa Clara Valley Subbasin

Values in thousand acre-feet

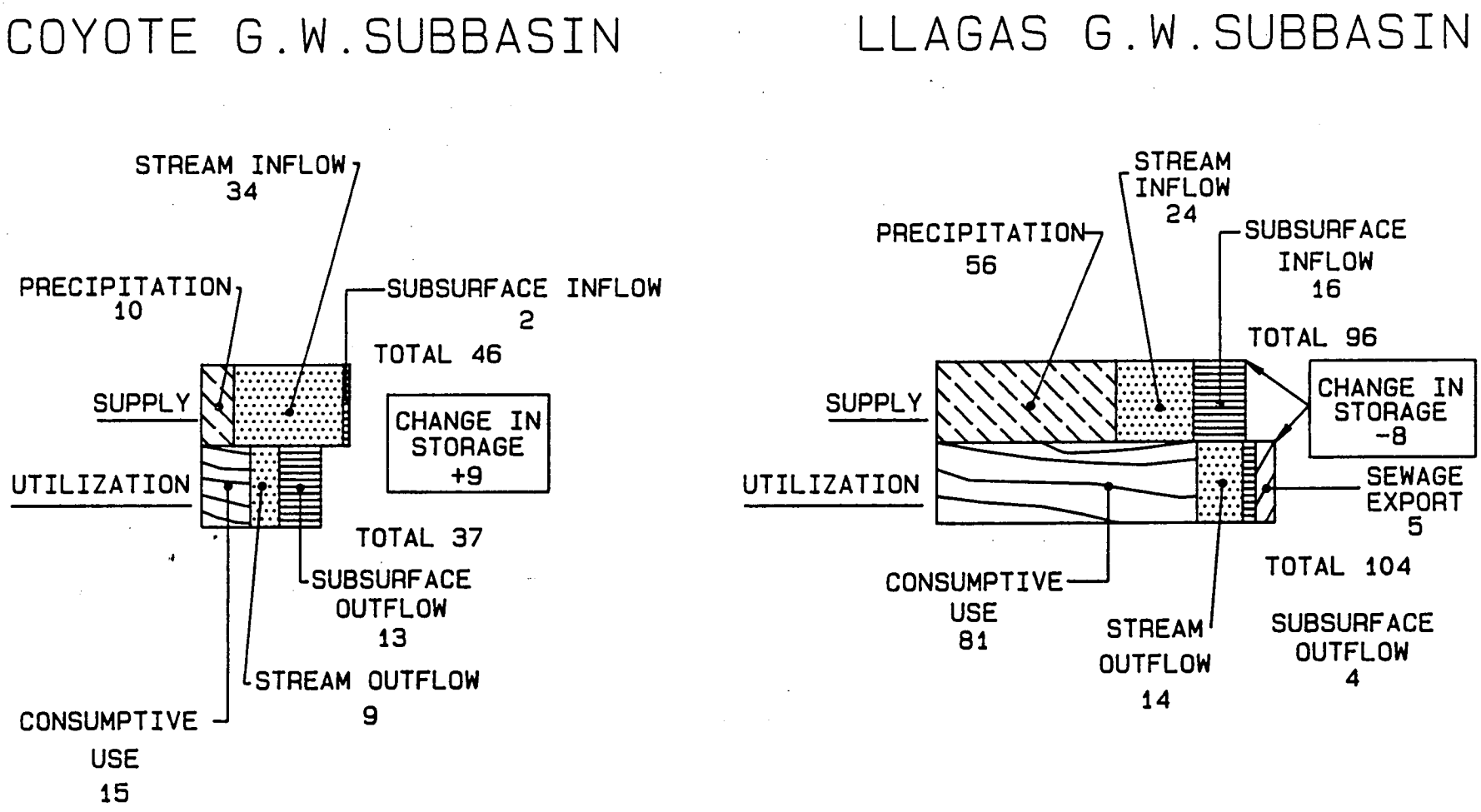


FIGURE 1-C HYDROLOGIC BALANCE OF GROUNDWATER 1984-85

Llagas and Coyote Subbasins

Values in thousand acre-feet

acre-feet for the Santa Clara Valley and Llagas Subbasins respectively and an increase of 2,000 acre-feet for the Coyote Subbasin, calculated using changes in groundwater elevation.

The discrepancy between the storage changes obtained as a net balance of hydrologic components and that determined with change in groundwater levels and storage capacity is the result of uncertainties involved in the estimates of the components. The lack of gaging stations, especially in the South County, further handicaps the accuracy of estimates.

Figure 2 shows historically the total amount of water supply available from local and imported sources, the total amount of water use, and rainfall data for the period 1965 through 1985 in the Santa Clara Valley Subbasin area. Local yield for each year is calculated as Total Annual Water Use and Net Annual Change in Groundwater and Reservoir Storage minus Imported Water from the South Bay Aqueduct (SBA) and Hetch Hetchy Aqueduct. On Figure 2, the local yield values for 1981 and 1983 have been adjusted from previous reports to conform with this.

Local water sources include groundwater produced from the Santa Clara Valley Groundwater Subbasin and surface water deliveries including San Jose Water Company diversions. The amount of SBA water used for groundwater recharge which was 21,000 acre-feet in 1984-85. The imported water deliveries consist of water delivered through the San Francisco Water Department's Hetch Hetchy Aqueduct, which began in Santa Clara County in 1952, and deliveries from the State Water Project through the South Bay Aqueduct which began in June 1965.

Actual water production in Santa Clara Valley Subbasin for the period 1970 through 1985 from all sources of supply is summarized in Table 1. Total supply and use for 1984-85 is illustrated in Figure 3.

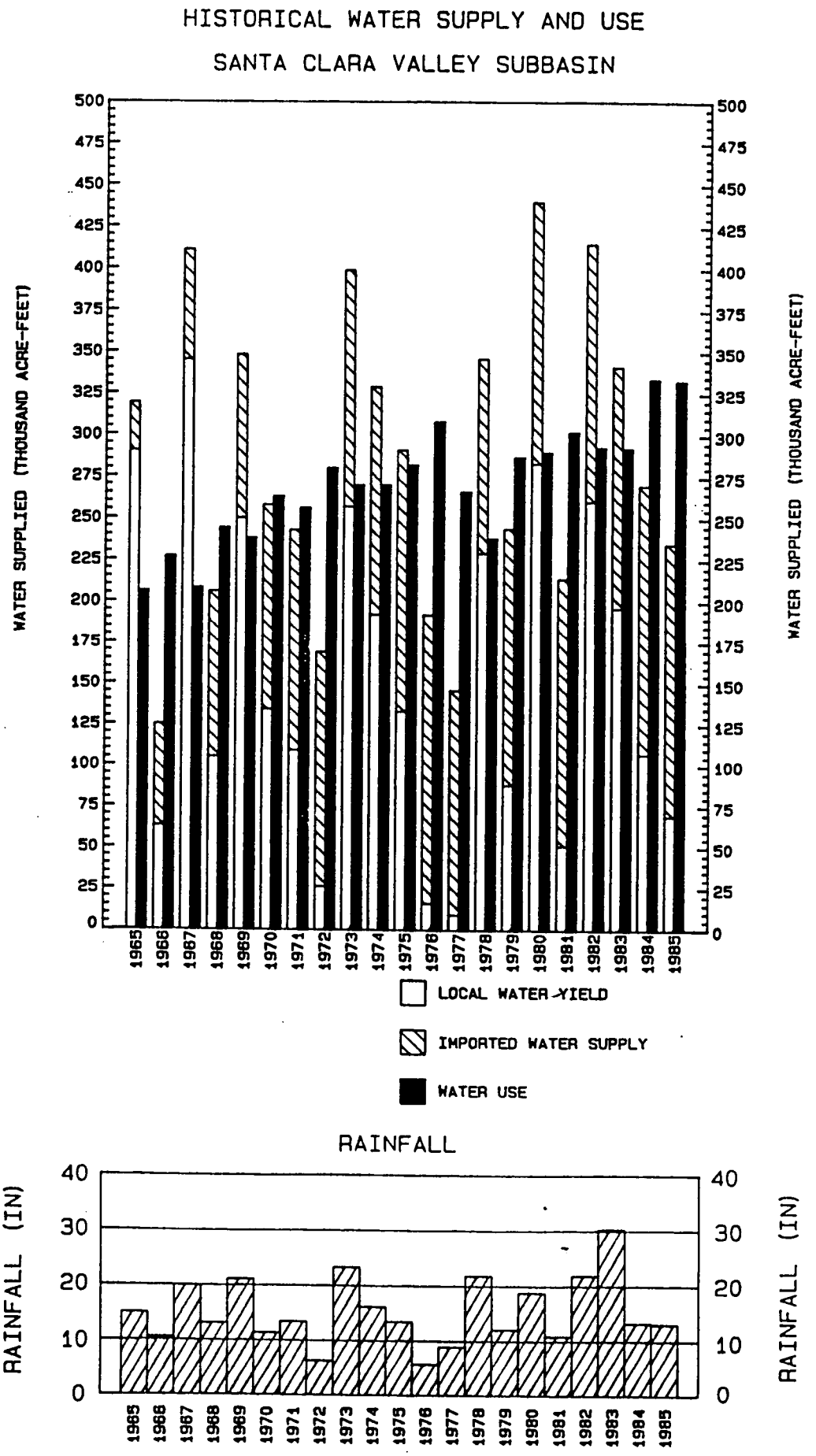

HISTORICAL WATER SUPPLY AND USE
SANTA CLARA VALLEY SUBBASIN
WATER SUPPLIED (THOUSAND ACRE-FEET)
LOCAL WATER YIELD
IMPORTED WATER SUPPLY
WATER USE
RAINFALL
RAINFALL (IN)

Figure 2

TABLE 1

WATER USE SUMMARY

SANTA CLARA VALLEY GROUNDWATER SUBBASIN
(Values in thousand acre-feet)

Year****	Surface Water Ag	Surface Water Non-Ag	Groundwater AG	Groundwater Non-Ag	Distribution of SBA Import* Treated	Distribution of SBA Import* Untreated *****	Hetch Hetchy	SJWCo. Diversion	Total *****
64-65	5.6		37.9	119.6			29.5	13.0**	205.6
65-66	11.6		38.5	130.8		***	33.6	12.4**	226.9
66-67	3.4		28.9	127.6		***	35.8	12.8**	208.5
67-68	9.1		35.5	138.3	7.9	***	39.9	13.9**	244.6
68-69	8.3		28.5	135.1	11.2	***	41.7	12.9**	237.7
69-70	4.9	0.8	29.3	125.1	39.2	0.5	48.3	15.8	263.4
70-71	4.4	1.1	23.7	124.3	44.0	0.7	45.2	12.9	255.6
71-72	4.8	1.5	24.0	142.1	48.8	0.8	50.1	8.8	280.1
72-73	4.2	1.6	17.5	137.7	45.0	0.6	48.9	14.6	269.5
73-74	3.0	1.8	15.9	129.0	45.5	0.6	52.2	20.8	268.2
74-75	3.5	1.9	16.9	120.4	67.4	0.6	53.3	17.5	280.9
75-76	5.0	2.0	20.0	148.4	66.1	0.8	56.8	8.5	306.8
76-77	3.9	1.6	16.7	136.0	60.4	0.7	47.7	0.7	267.0
77-78	2.4	1.5	11.7	115.4	59.5	0.8	37.3	10.0	237.8
78-79	2.5	2.0	12.0	137.7	66.7	0.7	50.6	15.5	287.0
79-80	2.2	1.4	9.8	139.3	71.3	0.7	51.0	14.3	289.3
80-81	2.0	1.5	9.6	151.2	72.2	0.8	57.5	7.4	301.4
81-82	1.6	1.9	7.2	139.8	67.5	0.5	59.3	14.8	292.1
82-83	1.1	1.2	5.9	139.7	72.1	0.8	58.2	14.2	292.4
83-84	1.4	1.1	6.5	163.5	80.0	0.7	67.2	14.1	333.8
84-85	1.4	1.3	6.0	174.1	78.8	0.7	65.8	5.4	332.8

* Imported SBA Water recharged to the groundwater basin included in groundwater used (20,000 acre-feet in 1984-85).
** Includes non-ag surface water deliveries.
*** SBA deliveries included in groundwater used.
**** Surface and groundwater information is for fiscal year, July-June. Other information is for water year, October-September.
***** The SBA untreated water deliveries are included as part of the Surface Water. Thus, it is not added separately into the Total water use.

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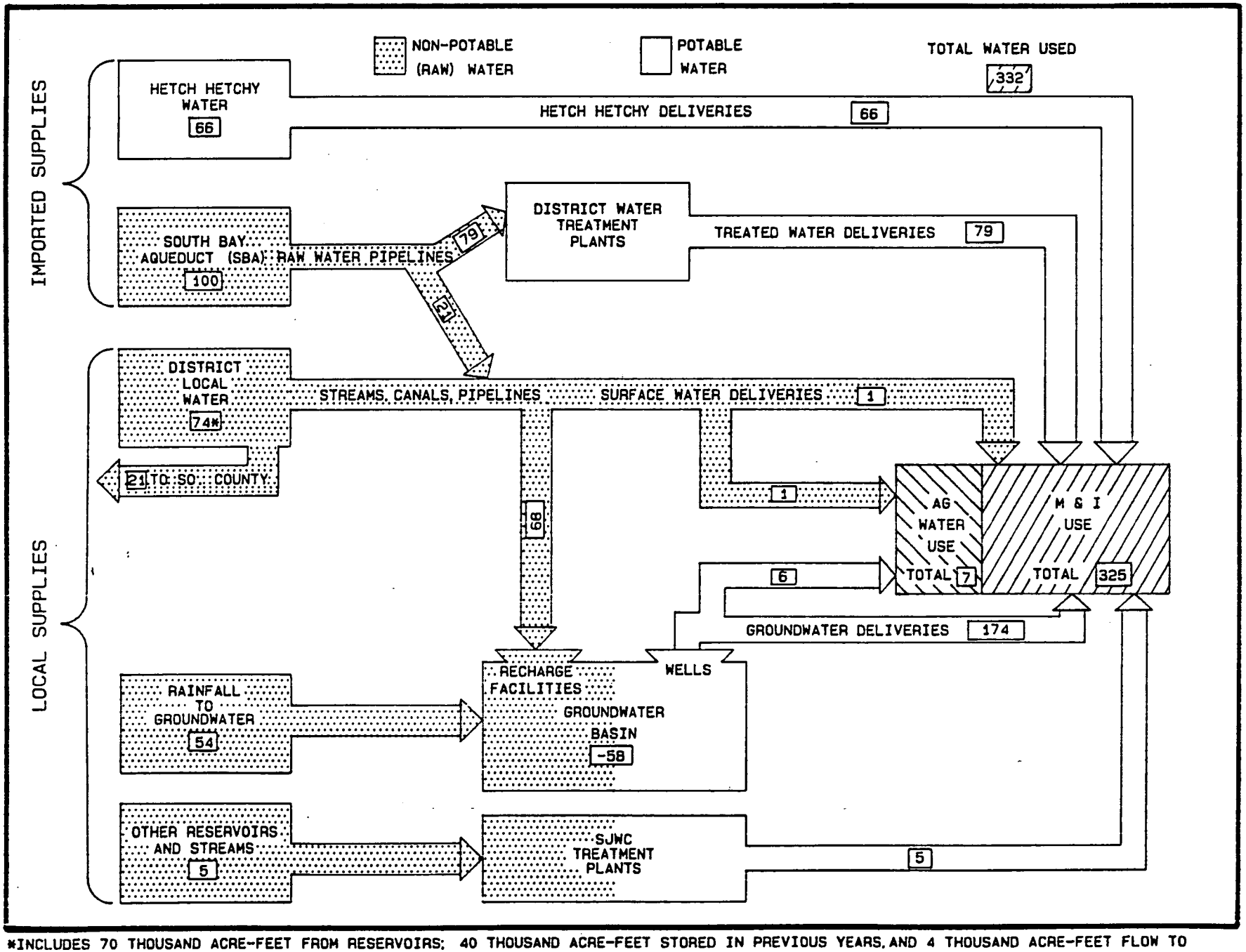
1984-85

WATER SUPPLY AND USE

Santa Clara Valley Groundwater Subbasin

(VALUES IN THOUSAND ACRE-FEET)



*INCLUDES 70 THOUSAND ACRE-FEET FROM RESERVOIRS; 40 THOUSAND ACRE-FEET STORED IN PREVIOUS YEARS, AND 4 THOUSAND ACRE-FEET FLOW TO

Figure 3

IV. WATER SUPPLY

A. Groundwater

Groundwater Levels

Plate 2 is a groundwater contour map showing lines of equal elevation of water levels in wells as of October 1, 1985 (traditionally the seasonal low). Plate 3 shows lines of equal change in elevation of water in wells between October 1984 and October 1985. Groundwater levels (determined from the unconfined area of the groundwater contour map) in the Santa Clara Valley Subbasin show an average decrease of 10.8 feet from 1984 levels. Levels in the Coyote Subbasin show an increase of 0.9 feet and the Llagas Subbasin a decrease of 8.6 feet. Plate 4 shows lines of equal depth to water as of October 1, 1985. These groundwater contours are based on information from more than 350 wells.

An index of the monthly fluctuation of water levels from 1963 to 1985 in the Santa Clara Valley, Coyote, and Llagas Subbasins is presented in Figure 4. Well hydrographs of Well Nos. 07S01E07R99 and 10S03E13D03 are used to represent trends in the Santa Clara Valley and Llagas Groundwater Subbasins, respectively. The Coyote Subbasin is represented on Figure 4 by the weighted average of depths to water in four representative wells, which are monitored at the beginning of each month. This weighted average is an index and as such does not represent the actual depth to water at any point within the Coyote Subbasin. The intent of Figure 4 is to show trends in the change of groundwater levels in the subbasins over the years.

Groundwater Recharge

The District, as part of its ongoing water management program, recharges the Santa Clara Valley, Coyote, and Llagas Groundwater Subbasins with imported water and local water.

INDEX OF GROUNDWATER LEVELS

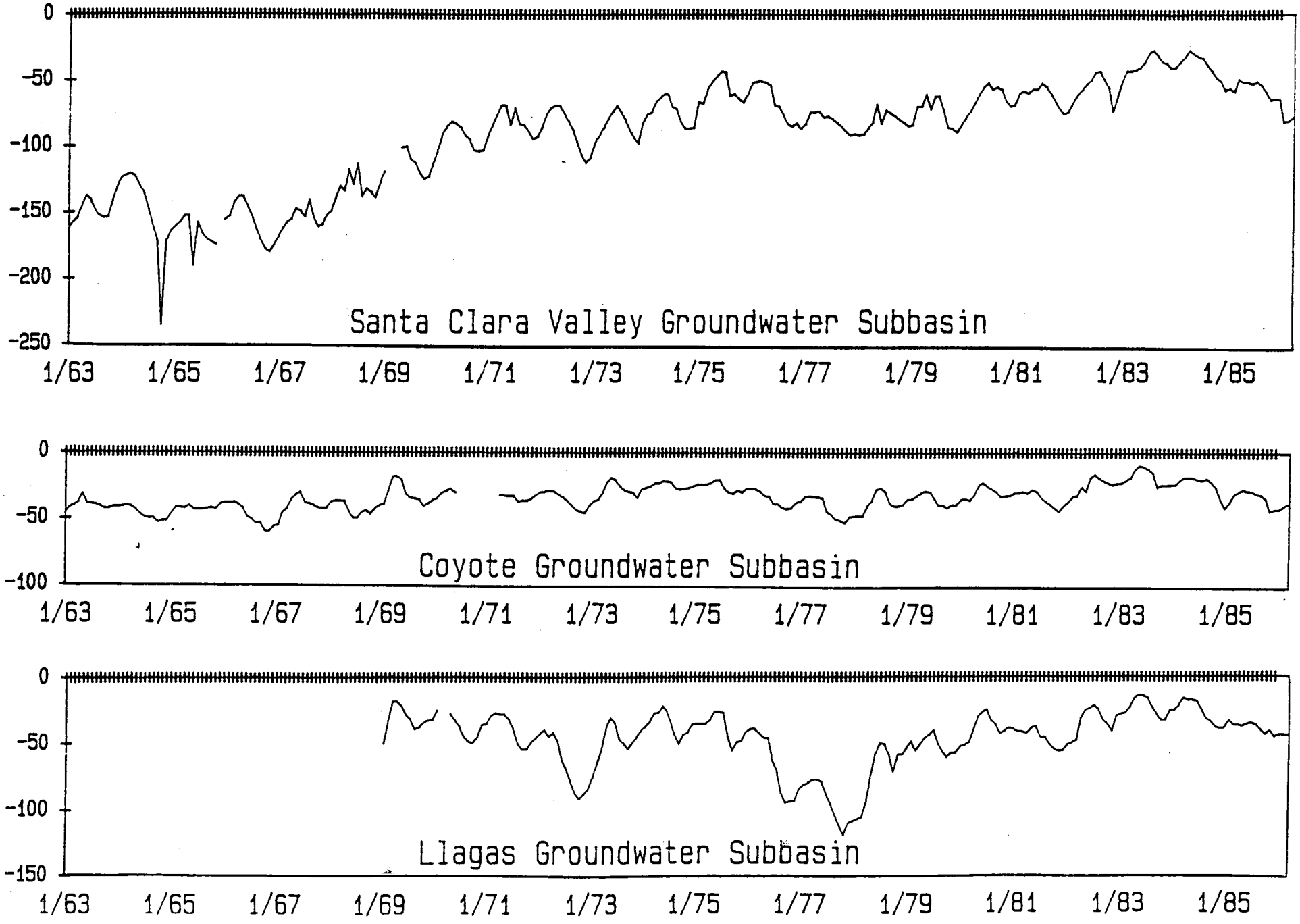


Figure 4

In 1984-85, which was a below average rainfall year, a total of 122,000 acre-feet of water were recharged in the Santa Clara Valley Subbasin. About 48,000 acre-feet of water were recharged from reservoir supplies and about 20,000 acre-feet were recharged from imported South Bay Aqueduct water. About 54,000 acre-feet were estimated to have reached the groundwater from rainfall. Additionally, 21,000 acre-feet of water were recharged in the Coyote and Llagas Subbasins from Anderson Reservoir through the Upper Coyote Creek, Main Avenue and Madrone Channel Recharge Facilities. The Llagas Subbasin is also recharged by Gavilan Water Conservation District with water conserved in the Uvas and Chesbro Reservoirs.

Land Surface Subsidence

Subsidence of the land surface occurs when intensive groundwater pumping results in lowered water pressures in the groundwater basin materials. These lowered water pressures increase the ability of the overburden load to compact the clay materials in and separating the aquifers. As a result, the clay materials consolidate with consequential sinking of the overlying land surface.

The District established a single level circuit around the south end of San Francisco Bay that was run annually from 1963 to 1976. This line of levels has not been run since 1976 because the amount of land surface subsidence has been less than the accuracy of the leveling. This level circuit was run again in the summer of 1988 and the interpretation of the results was inconclusive.

In 1960, the U.S. Geological Survey installed extensometers (compaction recorders) in 1,000 feet cased holes at the centers of subsidence, one in San Jose and another in Sunnyvale. These extensometers have recorded compaction of the confined aquifer system for over 20 years. Records from these instruments show that the compaction measured to a depth of 1,000 feet is about equal to the land surface subsidence as measured periodically by leveling of the bench marks.

According to Poland, "The subsidence in the Santa Clara Valley of California has been stopped by raising the artesian head in the aquifers until it equaled or exceeded the maximum pore pressures in the aquitards. The compaction and water-level records being obtained by the Geological Survey indicate that if the artesian head can be maintained 10 to 20 feet above the levels of 1971-73, subsidence will not recur. On the other hand, subsidence will recommence if the artesian head is drawn down as much as 20 to 30 feet below the 1971-73, levels."[1/]

B. Precipitation

Rainfall is the source of all locally developed water supplies. The long-term precipitation at San Jose is illustrated in Figure 5 as the accumulated departure from the mean which denotes graphically the wet and dry periods. The important feature in Figure 5 is the slope of the line, particularly whether it is positive (up) or negative (down). Each point is plotted as a difference from the long-term average; a wet year showing a positive difference and a dry or below normal rainfall year indicating a negative difference. If each difference is added to that of the previous year, a trend of positive or negative increments becomes apparent. An upward trend would, therefore, indicate a period of years which have received above normal rainfall and a downward trend would be indicative of a below normal period. Despite short term fluctuations, the long-term periods are easily discernible.

Beginning in 1875, rainfall approximated the long-term average until 1890 when a series of wet years began which generally continued until about 1916. The valley experienced low rainfall for several years following 1920 until 1935. It was during this drought period that valley residents first initiated a comprehensive water conservation program. The completion of the valley's first five water supply reservoirs in 1935

1/ Poland, Joseph F., "Land Subsidence in Santa Clara Valley, California", Water Spectrum, Department of the Army, Spring 1978, Vol. 10, No. 2.

ACCUMULATED ANNUAL DEPARTURE FROM 111-YEAR AVERAGE RAINFALL AT SAN JOSE

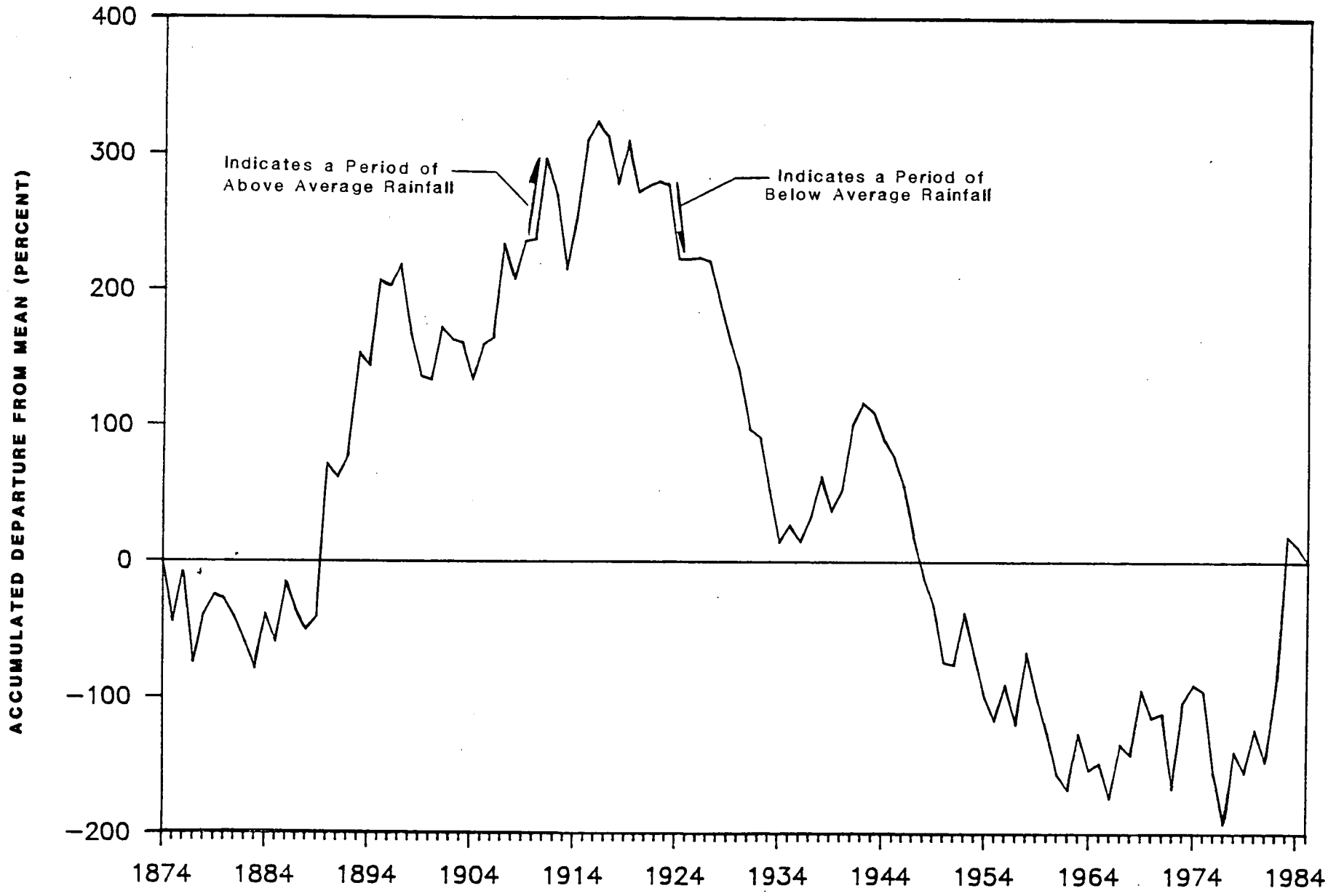


Figure 5

coincided with the beginning of a short interval of above-average rainfall. This enhanced the water supply picture and enabled groundwater levels, which had been declining, to recover.

Between 1943 and 1962, another series of dry years occurred. From 1962 to 1975, the valley rainfall was slightly above the long-term average. From 1975 to 1981, except for 1977-78 and 1979-80, rainfall was below average. In 1982 and 1983 rainfall was about 55 and 144 percent above average respectively. In 1984 and 1985 rainfall was about seven and eight percent below average respectively.

C. Imported Water

The existing and proposed water conveyance, treatment and distribution system for Santa Clara Valley is shown in Figure 6.

South Bay Aqueduct

The primary source of imported water for Santa Clara County is the South Bay Aqueduct. In 1984-85, 100,000 acre-feet of water were delivered into Santa Clara County through this facility. Of this total, 53,000 acre-feet were treated at the Rinconada Water Treatment Plant and 26,000 acre-feet were treated at the Penitencia Water Treatment Plant for delivery to consumers through retail water agencies. In addition, 748 acre-feet of raw water were delivered directly from District pipelines for use by individual contractors. The remaining 20,000 acre-feet were recharged into the Santa Clara Valley Subbasin through the District's recharge facilities.

During 1984-85, work was done on the South Bay Aqueduct, Penitencia Force Main, and Penitencia Delivery Main in the vicinity of the Penitencia Treatment Plant. The work included installation of additional valves and expansion joints, and this work was completed in July 1985.

Hetch Hetchy

San Francisco Water Department's Hetch Hetchy Aqueduct provides a second source of imported water. During water year 1984-85, this system delivered 65,860

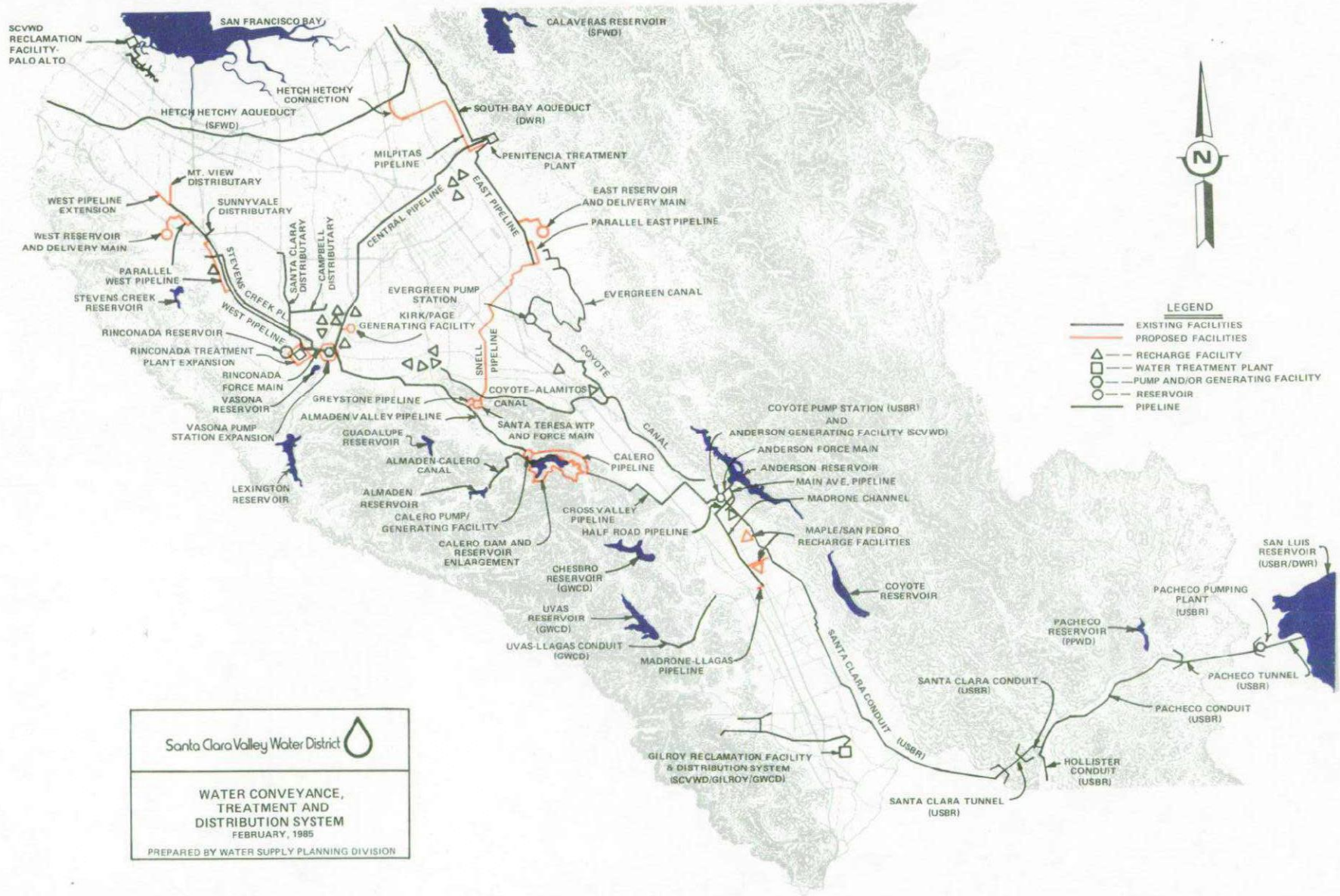

SAN FRANCISCO BAY
SCVWD RECLAMATION FACILITY-PALO ALTO
CALAVERAS RESERVOIR (SFWD)
HETCH HETCHY CONNECTION
HETCH HETCHY AQUEDUCT (SFWD)
SOUTH BAY AQUEDUCT (DWR)
MILPITAS PIPELINE
PENITENCIA TREATMENT PLANT
MT. VIEW DISTRIBUTARY
WEST PIPELINE EXTENSION
SUNNYVALE DISTRIBUTARY
WEST RESERVOIR AND DELIVERY MAIN
PARALLEL WEST PIPELINE
STEVENS CREEK RESERVOIR
STEVENS CREEK PL
SANTA CLARA DISTRIBUTARY
CAMPBELL DISTRIBUTARY
CENTRAL PIPELINE
EAST PIPELINE
EAST RESERVOIR AND DELIVERY MAIN
PARALLEL EAST PIPELINE
EVERGREEN PUMP STATION
EVERGREEN CANAL
KIRK/PAGE GENERATING FACILITY
WEST PIPELINE
RINCONADA RESERVOIR
RINCONADA TREATMENT PLANT EXPANSION
RINCONADA FORCE MAIN
VASONA RESERVOIR
SNELL PIPELINE
COYOTE CANAL
COYOTE-ALAMITOS CANAL
GREYSTONE PIPELINE
ALMADEN VALLEY PIPELINE
VASONA PUMP STATION EXPANSION
GUADALUPE RESERVOIR
SANTA TERESA WTP AND FORCE MAIN
ALMADEN-CALERO CANAL
CALERO PIPELINE
LEXINGTON RESERVOIR
ALMADEN RESERVOIR
CALERO PUMP/GENERATING FACILITY
CALERO DAM AND RESERVOIR ENLARGEMENT
CROSS VALLEY PIPELINE
HALF ROAD PIPELINE
CHESBRO RESERVOIR (GWCD)
UVAS RESERVOIR (GWCD)
UVAS-LLAGAS CONDUIT (GWCD)
MADRONE-LLAGAS PIPELINE
COYOTE PUMP STATION (USBR) AND ANDERSON GENERATING FACILITY (SCVWD)
ANDERSON FORCE MAIN
ANDERSON RESERVOIR
MAIN AVE. PIPELINE
MADRONE CHANNEL
MAPLE/SAN PEDRO RECHARGE FACILITIES
COYOTE RESERVOIR
SANTA CLARA CONDUIT (USBR)
GILROY RECLAMATION FACILITY & DISTRIBUTION SYSTEM (SCVWD/GILROY/GWCD)
SANTA CLARA TUNNEL (USBR)
HOLLISTER CONDUIT (USBR)
SANTA CLARA CONDUIT (USBR)
PACHECO CONDUIT (USBR)
PACHECO TUNNEL (USBR)
PACHECO RESERVOIR (PPWD)
PACHECO PUMPING PLANT (USBR)
SAN LUIS RESERVOIR (USBR/DWR)
N
LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
RECHARGE FACILITY
WATER TREATMENT PLANT
PUMP AND/OR GENERATING FACILITY
RESERVOIR
PIPELINE
Santa Clara Valley Water District
WATER CONVEYANCE, TREATMENT AND DISTRIBUTION SYSTEM
FEBRUARY, 1985
PREPARED BY WATER SUPPLY PLANNING DIVISION

Figure 6

acre-feet directly to the water supply systems of the Cities of Milpitas, San Jose, Sunnyvale, Santa Clara, Mountain View, and Palo Alto and to the Purissima Hills Water District, Stanford University, Moffett Field and Agnews State Hospital.

D. Construction

Bureau of Reclamation Facilities - As of September 1985, construction on the Pacheco Pumping Plant and Substation was substantially complete. Pacheco Conduit Section 1 was 99 percent complete and Section 2 was 82 percent complete. Santa Clara Conduit Section 1 was complete and Section 2 was 92 percent complete. Coyote Pumping Plant and Switchyard was 16 percent complete.

Santa Clara Valley Water District Facilities - Construction of the final phase of the Cross Valley Pipeline, Phase IV, Anderson Force Main from Cochran Road to Anderson Dam was completed in April 1985. This project allows water to be released from Anderson Reservoir to the Cross Valley Pipeline for conveyance to Calero Reservoir.

The Calero Pipeline will follow McKean Road from the end of Phase III of the Cross Valley Pipeline in the hills above Calero Reservoir to the Almaden Valley Pipeline near the base of Calero Dam. As of September 1985, the preparation of the Engineer's Report and the EIR was 55 percent complete.

The Snell Pipeline is one of the in-county components recommended in the 1983 East Santa Clara Valley Water Supply Plan. It will convey treated water from the Santa Teresa Water Treatment Plant and tunnel to the southern terminus of the existing East Pipeline located at White and Aborn Roads. The pipeline will consist of approximately 45,000 feet of pipe ranging from 60 to 72 inches in diameter. The planning study was completed and approved in 1985. As of September 1985, the design work on Phase I was 45% complete.

The Santa Teresa Water Treatment Plant will treat water imported through the San Felipe project. The draft EIR and the Engineer's Report were approved by the Board of Directors on October 2, 1984. As of September 1985, the design was 50 percent complete.

E. Water Conservation

The term "Water Conservation", as used in this report, refers to programs to manage and make the best use of water available to the District from all sources. "Water Savings" refers to efforts to reduce water use which is a part of any water conservation program. The District's water conservation program, an integral part of its overall water management activities, includes the management of local water storage facilities, wastewater reclamation, and water savings programs.

Local Storage Reservoirs

The District has constructed storage reservoirs on most of the major streams to retain seasonal runoff which is later released for groundwater recharge and direct surface irrigation. For 1984-85 District owned and operated eight dams and reservoirs with a combined capacity of about 155,000 acre-feet. Other public agencies in the County have constructed additional reservoirs with a total storage capacity of about 24,000 acre-feet. Another significant storage reservoir is San Jose Water Company's Lake Elsman with a capacity of about 7,500 acre-feet.

Table 2 shows the capacity, storage and percent full of all the reservoirs on October 1, 1984 and on September 30, 1985. On September 30, 1985, the total amount of water stored in all these reservoirs was 36,000 acre-feet, 44,000 acre-feet less than the storage on October 1, 1984. The storage in Gavilan Water Conservation District reservoirs decreased by 1,580 acre-feet and the Pacheco Water District's reservoir decreased by 2,660 acre-feet during this period.

During the 1984-85 water year several of the District's reservoirs underwent maintenance or upgrade programs. Previous investigations had identified and delineated geologic features that might be hazardous to safe operation of the District's dams and reservoirs. Repair and improvements continued on Coyote and Anderson Dam's Spillways. Coyote Dam Spillway Repair, Phase 2 construction was 57 percent complete as of September 1985. The planning for Anderson Dam Spillway was complete and the design work started.

Wahler Associates completed the report on preliminary remedial design investigation of Stevens Creek Dam in 1983-84. It had been judged to be unsafe at full capacity in the event of a major earthquake. Construction of improvements was 51 percent complete as of September 1985.

TABLE 2

RESERVOIR STORAGE

(Acre-Feet)

	Capacity	October 1, 1984		September 30, 1985	
Reservoir	Acre-Feet	Storage	Percent Full	Storage	Percent Full
Almaden	1,780	0	0	215	12
Anderson	91,280	49,995	55	17,532	19
Calero	10,050	3,319	33	3,888	39
Chesbro*	8,086	4,718	58	1,341	17
Coyote	23,670	11,808	50	10,291	43
Guadalupe	3,740	0	0	271	7
Lexington	20,210	6,699	33	0	0
Pacheco**	6,135	2,655	43	0	0
Stevens Creek	3,600	476	13	0	0
Uvas*	9,950	170	1	1,963	20
Vasona	410	342	83	279	68

* Gavilan Water Conservation District's reservoirs
** Owned by Pacheco Water District

Water Reclamation

In its search for new sources of water, the District, as early as 1958, engaged a private consultant to explore methods to reclaim sewage and industrial wastewater. An oxidation pond was constructed adjacent to the San Jose Water Pollution Control Plant. Tests were conducted over a two-year period yielding valuable information for future efforts.

In 1984-85, only one water reclamation plant was in operation.

Water Reclamation Facility, Palo Alto - Operation of the Palo Alto Reclamation Facility began in June 1977. This facility was designed to produce high-quality water at a rate of four million gallons daily by providing advanced wastewater treatment to effluent from the adjacent Palo Alto Regional Water Quality Control Plant. The water was to be used for dual purposes: 1) for injection through wells to create a barrier to salt water intrusion in a shallow aquifer near Palo Alto, and 2) for landscape irrigation.

The salt water barrier project did not work as initially conceived in part due to unexpected geologic complexities. Also, as groundwater levels recovered after the end of the 1976-77 drought, the need for a barrier against salt water intrusion diminished. Using the reclaimed water for irrigation did not meet with a very receptive market. Little water was sold and the water was expensive to deliver. As the ten year cooperative agreement with City of Palo Alto was expiring, continuing District participation was evaluated. In 1984-85 the District was exploring alternatives for turning over the facility to the City of Palo Alto.

Water Reclamation Facility, Gilroy - The wastewater reclamation facility in Gilroy was constructed under an emergency program to combat the severe overdraft of a limited groundwater subbasin and meet the need for new water supplies in the Gilroy area during the drought of 1976-77. The facility was constructed jointly by the Santa Clara Valley Water District, the City of Gilroy, and the Gavilan Water Conservation District.

The treatment system takes primary effluent from the City of Gilroy domestic sewage treatment plant and provides secondary treatment in an oxidation pond. The reclaimed water is used for agriculture and landscape irrigation. During 1984-85, 146 acre-feet of reclaimed water was sold.

Water Savings Program

Water savings is and always has been an integral part of the District's overall water supply program. During the 1977 drought, the District established an emergency goal of a 25 percent reduction in water use. This goal was later reduced to maintain a water savings of at least ten percent on the basis of pre-drought levels of use in order to ensure a balanced water supply for the future. All recent studies of future demand and required supplies have included the effects of such a reduction.

In mid-1980, the Department of Water Resources, Office of Water Conservation, the District and the City of San Jose, undertook a campaign to reduce consumption of water and to reduce flows to the sewage treatment plant. The water savings program consisted of distributing and promoting installation of water conservation devices to 475,000 households in Santa Clara County. Savings from this program are estimated to be about 4,000 acre-feet per year.

V. WATER QUALITY

To aid in the management and protection of the quality of all the waters in the valley, the District monitors the quality of waters in the streams, surface reservoirs, and the groundwater subbasins.

A. Streams

The in-stream surface water quality monitoring program established in 1980-81 consisted of sampling at 11 streamflow gaging stations as listed below:

Los Gatos Creek

Station 67	-below Lexington Reservoir
Station 59	-at Lark Avenue
Station 50	-at Lincoln Avenue

Guadalupe Creek

Station 43	-at Los Gatos Golf Course
Station 20	-at Alamitos Recharge System
Station 16900	-downtown San Jose

Coyote Creek

Station 9	-below Anderson Reservoir
Station 58	-at Edenvale

Llagas Creek

Station 69	-below Chesbro Reservoir
Station 11158555	-25 feet upstream of Machado School
Station 11153530	-at San Martin Avenue

These sampling stations were located at streamflow stations and were sampled during the report period for specific conductance, pH, temperature, DO (Dissolved Oxygen), hardnesses, Ca, Mg, Na, SAR (Sodium Adsorption Ratio), sodium percent, K, alkalinity, SO_4, Cl, F, SiO_2, solids, total and dissolved Nitrogen (NO_2, NO_3, NH_3 and organic), total phosphorus, dissolved metals (Al, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn), and TOC and total and fecal coliform.

Except for the metals, TOC, and the bacterial work, which were measured twice, all parameters were measured eight times each year.

The data collected will be used to identify long-term variations in quality and to evaluate the effects of change in land use and other activities on the quality of water in streams in Santa Clara County. A report containing all the data collected and its evaluation was completed in 1986.

B. Reservoirs

In 1974 the District began conducting limnologic investigations of the conservation reservoirs. Limnology is the study of physical, chemical, and biological conditions of a freshwater body, and its tributary streams and watershed. During 1984-85 the limnologic program consisted of: (1) ongoing limnologic monitoring of Anderson Reservoir; (2) ongoing limnologic investigation of Lexington Reservoir; and (3) continuation of the detailed investigation at Calero Reservoir. The Calero Reservoir Limnologic Investigation Report was under preparation during 1984-85.

The product of these investigations is an adequate collection of baseline water quality data for each reservoir. Evaluation of the information collected and observation of water quality trends aid in the identification of sources of contamination, in the prediction of impact of projected land use changes in the watersheds, and in the selection of reservoir operation criteria.

Data being collected at Calero Reservoir will be used to assess the treatability as a source of water to the future Santa Teresa Water Treatment Plant.

C. Groundwater

Currently, groundwater constitutes about half of the water used by domestic and agricultural users in Santa Clara Valley. Ultimately groundwater will be relied on to meet over 60 percent of the County's demand. Quality of the County's groundwater is of major concern to the District.

Hazardous Materials

The first incidents of groundwater contamination from organic solvents from leaky underground tanks were discovered in 1981. A cooperative report by the

Regional Water Quality Control Board, SEEHRL (Sanitation Engineering and Environmental Health Research Laboratory), University of California and the Santa Clara Valley Water District, Assessment of Contamination from Leaks of Hazardous Materials in the Santa Clara Groundwater Basin, was released in July 1985. It identifies 99 sites in the Santa Clara Subbasin for which the Regional Board has required an investigation of the extent of contamination and the development and implementation of cleanup plans. The incidents of contamination with organic chemicals tend to be centered around the areas of Palo Alto, Mountain View, Sunnyvale, Santa Clara and North San Jose, otherwise know as the Silicon Valley.

There are two major cases located in the Blossom Valley area of South San Jose in the unprotected forebay area of the Santa Teresa groundwater subbasin. Although it will take years to clean up these sites, the areas of contamination associated with each of these leaks are well defined and considered to be under control. However, these two cases are of particular concern because of their potential to readily contaminate the deeper confined portion of the groundwater basin. There has, in fact, been trace levels of contamination found in water supply wells drawing water from confined portions of the aquifer, the source of which is believed to be the Blossom Valley forebay area. Therefore, groundwater produced from this area is monitored quite frequently for a wide range of chemical constituents to insure the safety of the drinking water supply. One public water supply well has been removed from service.

In addition to the above-mentioned localized monitoring, State legislation (AB 1803) now requires all municipal water retailers to test representative wells in their water system for organic chemical contamination.

In the Silicon Valley a thick clay layer underlies the area which separates the shallow aquifer from the deeper, heavily pumped aquifer. This affords some protection for the deeper aquifer, however, groundwater contamination in the area is still of concern because of the potential for conduits through the clay aquitard. The shallow

aquifer is more susceptible to contamination from surface sources, but the water drawn from there is used to supply only a small number of private wells, mostly for irrigation purposes.

Saltwater Intrusion

Another continuing groundwater quality concern is saltwater intrusion into fresh water aquifers. Saltwater intrusion has occurred in aquifers along the Baylands area bordering South San Francisco Bay in Santa Clara County. Recognizing the problem, SCVWD conducted a study to assess existing conditions and to evaluate possible actions that would be required to prevent or minimize further intrusion. The study concluded that presently, saltwater is mostly contained within the upper aquifer (above 150 feet) in depth. However, some areas of the main aquifer (below 150 feet) also contain saltwater.

Saltwater is most likely finding its way through defective or improperly sealed or abandoned wells. Based upon these findings, District staff designed a project to alleviate this situation. The project was approved for grant funding under the State Clean Water Assistance Program. The Saltwater Intrusion Prevention project objective is to locate and seal or repair old wells which were not properly constructed or maintained, or have been abandoned or improperly destroyed, and which may be providing conduits for interaquifer transfer of saltwater. This will prevent or substantially reduce the possibility of further degradation of the lower aquifers. Phase I of the project, field canvassing and sampling of wells along San Francisco Bay, was completed as of July 1985. Since the beginning of the study, some of the wells identified as possible culprit wells had already been sealed by the District's well sealing program. Follow-up on all possible culprit wells was being done and a summary report was being prepared in 1984-85.

Well Sealing Program

The deeper aquifers are of major importance to the water supply of the general public and the protection of these aquifers is a primary goal of the District. In order to

protect the deep aquifer from contamination, the District has embarked on a program intended to seal abandoned or out-of-service wells which might serve as conduits for contaminated water in the shallow aquifer to travel down to the deep aquifer. As of September 1985, from the well sealing program's first set of 160 wells, 65 wells were sealed, 45 wells have been destroyed in the field since 1980 and 35 more were to be sealed. A second set of 250 wells has been identified for investigation. These wells include those that were identified in the saltwater intrusion study.

Local Problems

In addition to the hazardous materials and saltwater contamination described above, there are localized areas in the County that have yielded groundwater of poor quality as a result of contamination from surface waters or degradation from subsurface sources.

High levels of nitrates have been confirmed in portions of South County. The principal sources of nitrates entering the Llagas and Coyote groundwater subbasins are nitrate from fertilizers carried by irrigation water that percolates through the soil and effluent from individual waste treatment and disposal systems.

VI. GLOSSARY*

Acre-Foot - A measurement of volume of water equaling 43,560 cubic feet or 325,851 gallons, an amount that would cover an area of an acre, one foot deep (a football field would be covered one and a quarter feet deep).

Aquifer - A geologic formation that stores, transmits, and yields significant quantities of water to wells and springs.

Aquitard - A geologic formation which, although porous and may store large quantities of water, will not transmit water fast enough to yield an appreciable supply for a well.

Artesian Well - A well in which water is lifted by hydrostatic pressure above the land surface at the well.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen consumed in biological processes that decompose organic matter in water.

Confined Aquifer - An aquifer overlain by material sufficiently impervious to retain groundwater in the aquifer under pressure.

Connate Water - Water which was entrapped in a geologic formation at the time the formation was deposited. If the formation was deposited in the ocean or a saline lake, the connate water is also saline.

Consumptive Use - Water consumed by vegetative growth in transpiration and building of plant tissue, and water evaporated from adjacent soil, from water surfaces, and from foliage. Also, water similarly consumed and evaporated by urban and nonvegetative types of land use.

Contamination - An impairment of the quality of water by waste to a degree which creates a hazard to the public health through poisoning or through the spread of disease. "Contamination" shall include any equivalent effect resulting from the disposal of waste, whether or not waters are affected.

Cubic Feet Per Second (CFS) - A unit of measurement of flowing water; the number of cubic feet of water which passes a given point in a second.

Dissolved Oxygen (D.O.) - The oxygen dissolved in water. It is essential for aquatic life.

Dry Period - An historic period of years when water supply is much below normal. An example was 1929-34 when the water in northern California streams averaged only about 38 percent of normal. It has been used as the reference drought situation in much water resource planning.

Evaporation - The process by which surface or subsurface water is converted to atmospheric vapor.

Evapotranspiration - Water withdrawn from soil by evaporation and plant transpiration (a consumptive use).

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* From Santa Clara Valley Water District's "Glossary of Terms", April, 1977.

Flood Insurance - The transfer of the risk of monetary loss due to flooding to another in accordance with the National Flood Insurance Program.

Floodplain - The relatively flat area adjoining a river or lake that may be covered by floodwater.

Gradient - The rate of change per unit of length, such as the slope of the land, stream channel, or any surface.

Groundwater - Subsurface water in saturated porous rocks and soils.

Groundwater Basin - Areas where water is stored below the ground surface.

Groundwater Recharge - The process whereby water seeps from the surface down through soil materials to become groundwater.

Groundwater Recharge Basins - Depressions where water is placed so that it can seep into the ground.

Hydrologic Cycle - The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages of precipitation, consequent runoff, streamflow, infiltration and underground movement, eventual evaporation, and reprecipitation.

Hydrology - The applied science concerned with the waters of the earth in all its states - their occurrences, distribution, and circulation through the unending hydrologic cycle.

Hydrology, Groundwater - The branch of hydrology that deals with groundwater, its occurrence, movement, replenishment, and depletion.

Imported Water - Water that is moved from one drainage basin to another. (Example: Water is moved from the Sacramento-San Joaquin Valleys through canals and pipelines into the Santa Clara Valley.)

Infiltration - The movement of water through the soil surface and into the soil.

Injection Well - Well used for introduction water into an aquifer. Technique used to stop seawater intrusion, replenish an aquifer, or dispose of cooling water.

Overdraft - The condition in a groundwater basin where the amount of water withdrawn by pumping exceeds the amount of water replenishing the basin over a long time period.

Perched Groundwater - Groundwater occurring in a saturated zone separated from the main body of groundwater by unsaturated rock (or soil).

Percolation - The movement of water, under natural pressures developed underground, through the interstices of the rock or soil.

Percolation Pond - See Groundwater Recharge Basin.

Permeability - A measure of the ability of a material to convey water.

Piezometric Level - The level to which water will rise in a well that penetrates a confined aquifer.

Point Source - Any discernible confined and discrete conveyance from which pollutants are or may be discharged.

Pollution - An alteration of the quality of water to a degree which unreasonably affects: (1) such waters for beneficial uses, or (2) facilities which serve such beneficial uses. "Pollution" may include "contamination."

Potable Water - Water which does not contain objectionable pollution, contamination, minerals, or infection and is considered satisfactory for domestic consumption.

Precipitation - The total measurable supply of water received from clouds as rain, snow, hail, or sleet.

Primary Treatment - The first major stage in wastewater treatment, usually sedimentation. Floating and settleable solids are removed in this stage.

Salinity - The concentration of salts dissolved in water.

Secondary Treatment - The second major step in wastewater treatment using biological methods to decompose the organic wastes carried by the water.

Semiperched Groundwater - Shallow groundwater overlying a body of groundwater from which it is not separated by any unsaturated alluvium (perched groundwater but not separated by an unsaturated zone from the main groundwater body; separation is achieved by the nearly impermeable nature of the perching clay layer and if the main groundwater body were drawn down, a true perching condition would result).

Spreading Dam - A low artificial barrier built in a stream to pond water to increase groundwater recharge capacity.

Subsurface Inflow - Underground waters of the hills and mountains or adjacent groundwater basins that move into the groundwater basin under consideration. This water is subsurface outflow from the hills and mountains or the adjacent grondwater basin.

Surface Diversion - The taking of water from a stream or other body of surface water into a canal, pipeline, or other conduit.

Surface Water - Water that rests on the surface of the earth, such as streams and rivers, ponds, lakes, and reservoirs.

Suspended Solids (SS) - Small particles of matter that are carried in suspension in water.

Tertiary - Treatment processes in addition to the normal secondary treatment of wastewaters. Generally, these are chemical and physical processes.

Total Dissolved Solids (TDS) - The amount of organic and inorganic matter (by weight) dissolved in a given quantity of water. It is usually stated in parts per million (ppm) or milligrams per liter (mg/l).

Treated Water - Water that has been treated to make it suitable for domestic service (see Potable Water).

Turbidity - A measure of fine suspended matter (usually colloidal) in liquids. The fine particles may be visible as a bulk unit but are not large enough to be seen as individual particles by the naked eye; in total they restrict the passage of light through the liquid.

Unconfined Aquifer - An aquifer such that the piezometric surface of the groundwater retained within it falls below the bottom of any upper confining bed.

Water Quality - The chemical, physical, and biological properties of water which affect its suitability for use.

Watershed - The land area from which water drains to a given point (a drainage area, drainage basin, or catchment area).

Water Table - The surface where groundwater is encountered in a well in an unconfined aquifer.

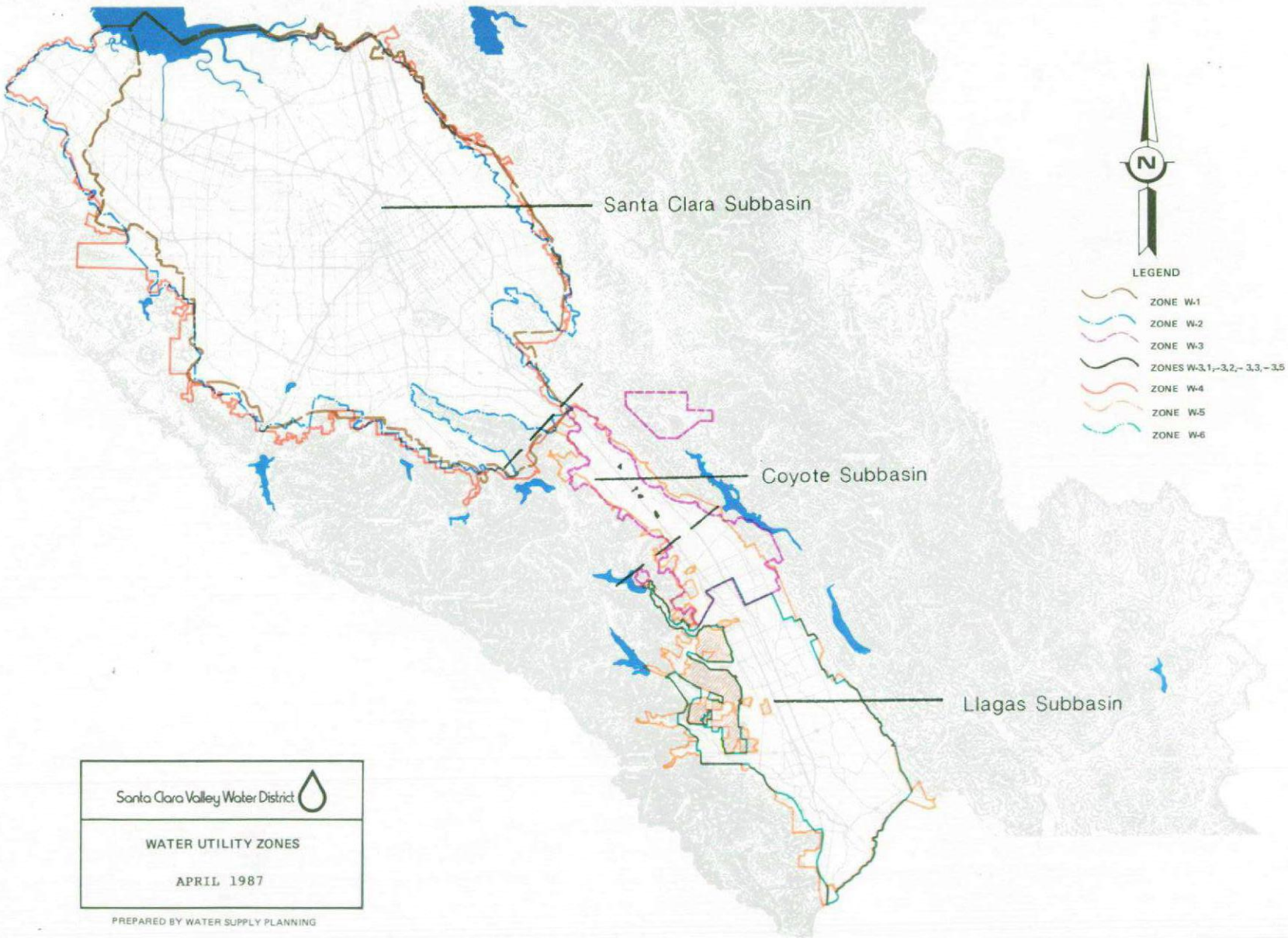
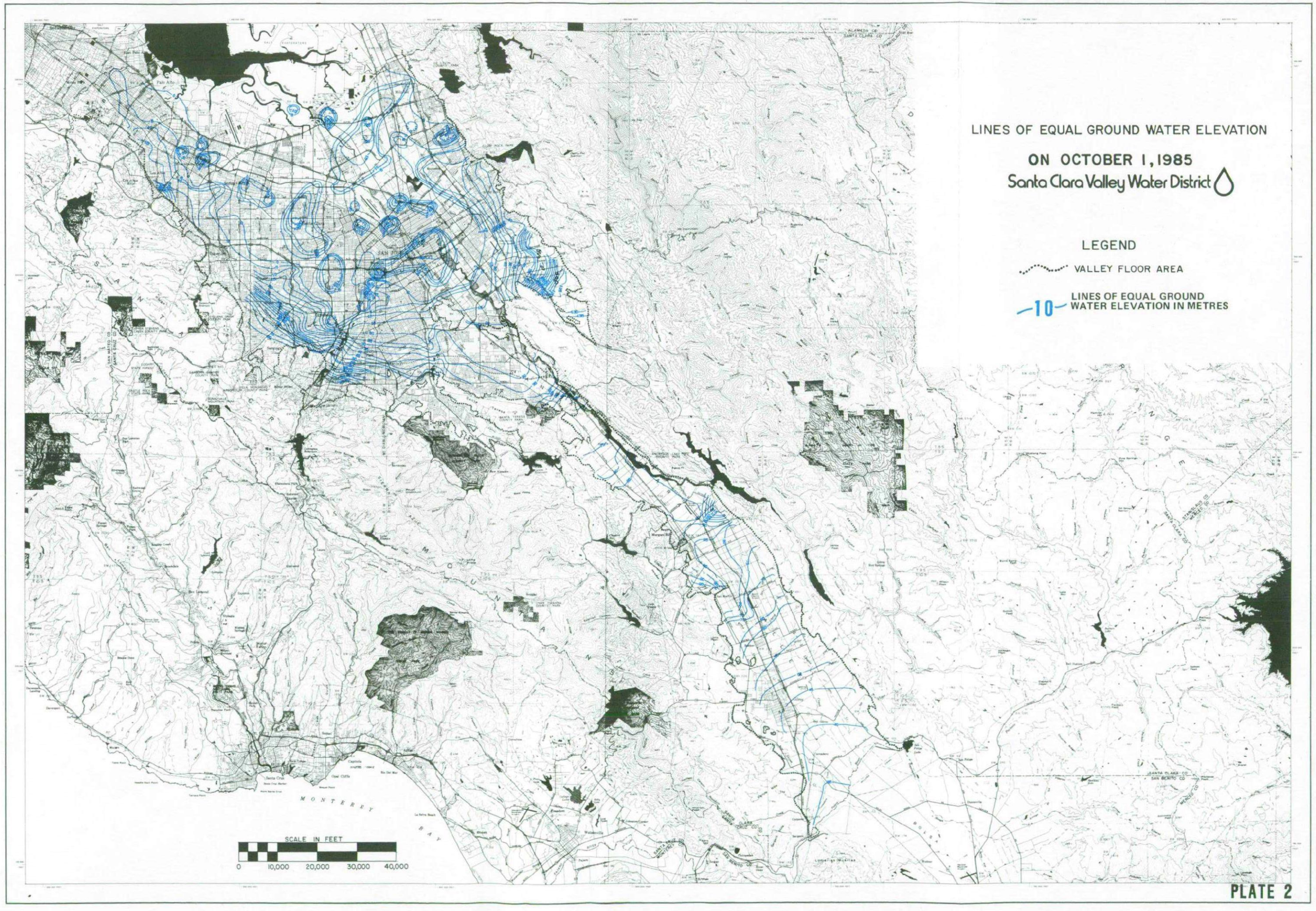

Santa Clara Subbasin
Coyote Subbasin
Llagas Subbasin
N
LEGEND
ZONE W-1
ZONE W-2
ZONE W-3
ZONES W-3.1,-3.2,-3.3,-3.5
ZONE W-4
ZONE W-5
ZONE W-6
Santa Clara Valley Water District
WATER UTILITY ZONES
APRIL 1987
PREPARED BY WATER SUPPLY PLANNING

PLATE I


LINES OF EQUAL GROUND WATER ELEVATION
ON OCTOBER 1, 1985
Santa Clara Valley Water District
LEGEND
VALLEY FLOOR AREA
10
LINES OF EQUAL GROUND WATER ELEVATION IN METRES
SCALE IN FEET
0
10,000
20,000
30,000
40,000
MONTEREY BAY
PLATE 2

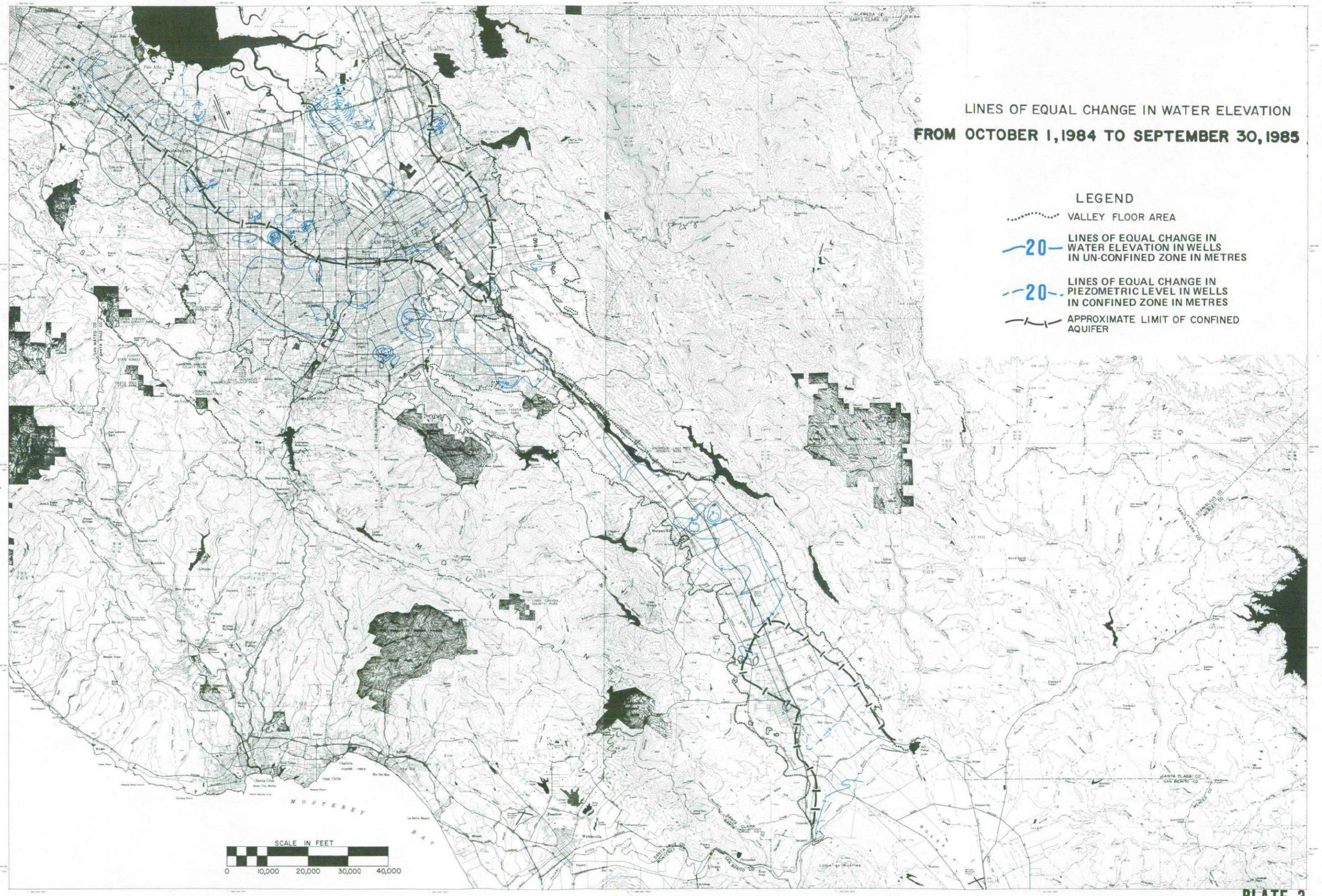

LINES OF EQUAL CHANGE IN WATER ELEVATION
FROM OCTOBER 1, 1984 TO SEPTEMBER 30, 1985
LEGEND
VALLEY FLOOR AREA
20
LINES OF EQUAL CHANGE IN WATER ELEVATION IN WELLS IN UN-CONFINED ZONE IN METRES
20
LINES OF EQUAL CHANGE IN PIEZOMETRIC LEVEL IN WELLS IN CONFINED ZONE IN METRES
APPROXIMATE LIMIT OF CONFINED AQUIFER
SCALE IN FEET
0
10,000
20,000
30,000
40,000
MONTEREY
BAY

PLATE 3

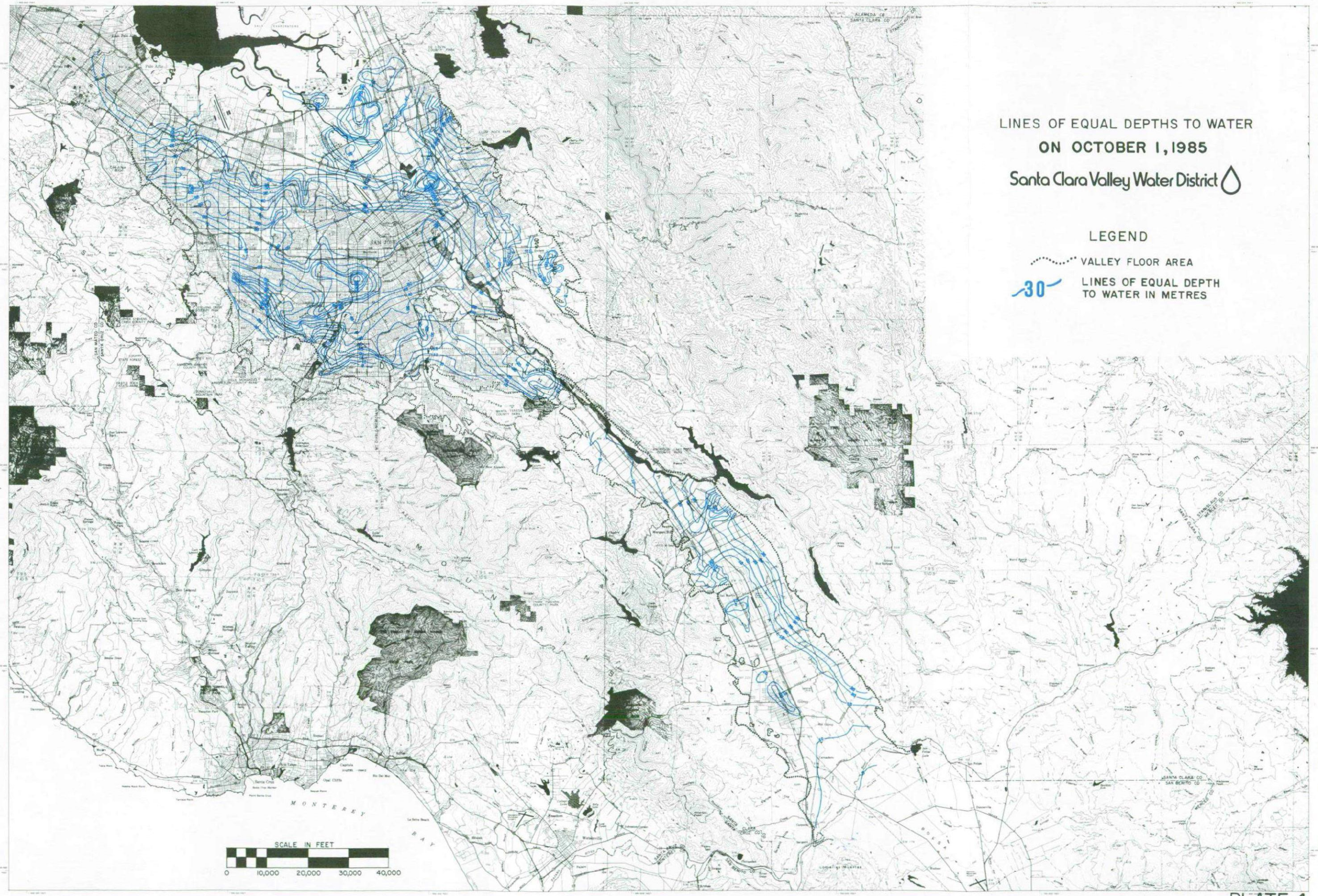

LINES OF EQUAL DEPTHS TO WATER
ON OCTOBER 1, 1985
Santa Clara Valley Water District
LEGEND
VALLEY FLOOR AREA
30
LINES OF EQUAL DEPTH TO WATER IN METRES
SCALE IN FEET
0
10,000
20,000
30,000
40,000
MONTEREY BAY
SANTA CLARA CO
SAN BENITO CO

PLATE 4